

adaptive reaction, so widespread a phenomenon in the biological world, remains unsolved. Until we know a great deal more than we do at present about the physico-chemical connection of stimulus and response it is likely to remain so.

A. G. T.

CLIMATE AND MAN.

The Pulse of Asia: a Journey in Central Asia illustrating the Geographic Basis of History. By Ellsworth Huntington. Pp. xxi+416. (London: A. Constable and Co., Ltd.; Boston and New York: Houghton, Mifflin and Co., 1907.) Price 14s. net.

IN NATURE, vol. lxxii., 1905, p. 366, some account was given of the expedition of the Carnegie Institution of Washington to Eastern Persia and Turkestan. Mr. Huntington showed his descriptive power in the joint memoir issued in that year; and he dedicates his new book to Prof. W. M. Davis, his instructor in the "rational science" of geography, and his companion in arduous travel. Mr. Huntington states that, thanks to the help of Prof. Davis, he spent three years in Central Asia, in addition to four previously spent in Asia Minor. His study of languages has again and again been of service to him; and it is interesting to note at one point (p. 153) the struggle between his natural sympathy and the need for a little self-assertion, which, to the Oriental, is an outward sign of self-respect. His relations with the Khirghiz, and even with the feebler Chantos, were pleasant in the extreme; we fancy that something more fundamental than a training in geography gave him his thoughtful perception of the conditions and limitations of their lives.

The map of Asia, and no small part of it, is required to reveal the significance of the author's routes. The high passes of the Kwen Lun and Tian Shan ranges are mere incidents in these loops of travel, which lead us from Batum across Bokhara, and as far east as the shrinking salt-lake of Lop Nor.

Nine months were spent in the Lop Basin alone, and one of the finest things in the book is the general account of the succession of physical and climatic zones (chapter iv.), as one descends from the mountains across a ring of river-gravels to the edge of the region of desiccation. Here the fine sands and muds of old flood-plains are to-day whirled up before the wind, and are deposited as loess on the mountain-pastures to the south. The life of the nomadic inhabitants of the basin is practically limited by this pastoral land, which occupies all but the highest parts of the plateau-zone; and this zone terminates in steep slopes inwards, rising "like a continental ring around a sea forever dry." Down below, patches of forest-land are already poisoned by salt, and dying tamarisk bushes mark the spread and triumph of the desert.

All through Mr. Huntington's chapters we trace the same compelling influence. The desert, with its rippled and shifting dunes, its "hateful haze" swept onward by the wind, its inexorable hostility, demanding an inexorable endurance (p. 260), is driving man steadily before it, and has him, as it were, over leagues of country, by the throat. Old irrigation-channels have been abandoned, from failure at their source;

old roads around lake-basins have given place to direct tracks across their floors. Even in mountain-gorges, streams have run dry, leaving the lower ground dependent on the sudden and dangerous torrents that follow on each melting of the snows. Springs may temporarily arise in desiccated areas, and may furnish real rivers as time goes on (p. 182); but such incidents only temporarily retard the retreat of man, who leaves lost cities behind him, still "beautiful in the clean, graceful shrouds of their interment in the sand." Archæological research, local legends, the experience of recent generations, all show that the drying up of Central Asia is a continuous phenomenon; yet a "climatic pulsation" in an opposite direction is traceable, both in the Caspian and Lop Nor Basins, in the "Middle Ages" following on 500 A.D.

The conditions of the still older dry or "interfluvial" epoch have not even now been reproduced, since (p. 351) there are places in the Tian Shan range, now too cold and wet for agriculture, where canals were once made to provide for irrigation. Mr. Huntington throughout acknowledges the work of Brückner and his other predecessors in these fields of travel, observation, and deduction, and has, in his later pages, urged the climatic aspect of human movements to an almost hazardous extreme. He set out (p. 6) to use Central Asia as a text "to show the immense influence which changes of climate have exerted upon history." In this respect his book does not quite rise to the anticipated level, which is reached more nearly in the memoir issued by the Carnegie Institution. But, with its simple record of perilous adventures, its excellent illustrations, and its clear devotion to science first of all, it forms a noteworthy and inspiring work of travel. Throughout it we feel, as the author means us to feel, the insistent pressure of natural law against the will and work of mortals--the helplessness of millions of men against the untimed pulse of Asia.

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THE MODERN MICROSCOPE.

Microscopy: the Construction, Theory, and Use of the Microscope. By E. J. Spitta. Pp. xx+472; 16 plates. (London: J. Murray, 1907.) Price 12s. 6d. net.

MICROSCOPISTS are at present divided into two factions. There are those of the old school, who are content with the principles under the guidance of which such great improvements have been made in microscope construction since the earlier days of Abbe; and there are those whom we may call the "Gordon rioters," who hold that Abbe's experiments were inconclusive and even misleading, and have found a new prophet. The new theory--the adjective has at least some justification--has been duly set forth, with a mint of strange phrases, in Sir A. E. Wright's "Principles of Microscopy," already reviewed in these pages (vol. lxxv., p. 386, February 21, 1907). Mr. Spitta is of the older school. He is for "legitimate methods of observation." He casts an oblique and somewhat mistrustful glance upon the new practices, and hurries by to surer and more familiar ground.

Not so Mr. Conrady, who contributes to the present volume a couple of chapters on the undulatory theory of light, and on Abbe's diffraction theory of the microscope image. Mr. Conrady "has no use" for the new theory, propounded long since by Dr. Altmann, and only of value in that it called forth a complete and overwhelming reply from Abbe in his well-known paper "Über die Grenzen der geometrischen Optik." He urges strongly the adequacy of the diffraction theory to explain all the observed phenomena, and is emphatic as to the inapplicability to the microscope of the theory of the Airy diffusion-disc.

This, however, is not the place to enter on this much-discussed but fascinating topic, with which, indeed, Mr. Spitta's book, from its plan and object, is but little concerned. It is the practical rather than the theoretical to which attention is directed, to the intelligent handling of one of the most finished and delicate of optical instruments.

From this point of view, let us hasten to urge every student of the microscope who wishes to gain a thorough understanding of its principles and possibilities and its defects, and every user of the instrument who desires a work of reference to which he may turn for an explanation of some unexplained optical phenomenon, or for particulars of up-to-date apparatus, to procure a copy of Mr. Spitta's book without delay. It is a leisurely book—an unfriendly critic might even call it diffuse—but there is scarcely a chapter which will not repay careful reading; and when one comes to the chapter on "Testing Objectives," one can but feel grateful to Mr. Spitta for his admirable treatment of a difficult subject.

Mr. Spitta has called his work "Microscopy"; but it is only of one branch of microscopy that he treats. His subject is the theory and use of the microscope as an optical instrument; with the preparation of objects for the microscope he does not deal. The book will be of much interest and of great value to many who are in no sense "microscopists," but who use the microscope as an accessory in other physical investigation. The non-mathematician who desires to know the meaning of the terms "numerical aperture," the "sine-law," "resolving power," or to make himself familiar with the essentials of the Abbe theory, will find Mr. Spitta a satisfactory guide; and the microscopist proper will find innumerable useful suggestions as to the manipulation of his instrument.

It will be well to indicate shortly the ground Mr. Spitta covers. After a preliminary account of the elements of geometrical optics and the theory of the simple microscope, he proceeds to deal with the compound microscope in its modern form, fine adjustments, mechanical stage, substage, objectives—achromatic, semi-apochromatic, and apochromatic; dry and immersion—with details and illustrations of the work of the best makers. In connection with objectives the chief optical properties, spherical and chromatic aberration, the sine-law, &c., are discussed. Then follow chapters on numerical aperture, eyepieces, magnification—in which may be found the main principles of the Abbe theory—the substage condenser, and methods of illumination—critical light, mono-

chromatic light, dark ground illumination, Rheinberg's multiple colour illumination, oblique light, illumination of opaque objects, polarised light. Then we come to "the use of the microscope," with which may be mentioned the valuable hints to workers with which the volume concludes. The binocular microscope and measurements with the microscope are treated, and a long chapter is devoted to the discussion and illustration of microscopes by different makers for various purposes, which is a feature of the book.

Then follows the excellent account of the testing of objectives already referred to. Mr. Spitta confines himself to the use of the Abbe test-plate, and of specified test objects, but within these limits he goes into the matter in detail and with admirable clearness, and this chapter alone is sufficient to justify the work. The section is illustrated in sixteen plates by a beautiful series of photomicrographs. Mr. Conrady's two chapters follow, with another on accessory apparatus. The usefulness of the book is completed by a satisfactory index.

We have said enough to commend Mr. Spitta's volume. It teems with "tips," and is likely to command an even wider popularity than his previous books on allied subjects.

MATHEMATICAL TEXT-BOOKS.

- (1) *Easy Exercises in Algebra for Beginners.* By W. S. Beard. Pp. x+134. (London: Methuen and Co., n.d.) Price 1s. 9d.
- (2) *Plane Geometry for Secondary Schools.* By C. Davison and C. H. Richards. Pp. viii+411. (Cambridge: University Press, 1907.) Price 4s.
- (3) *Cartesian Plane Geometry.* Part i. By Charlotte A. Scott. Pp. xiv+428. (London: J. M. Dent and Co., 1907.) Price 5s.
- (4) *A Sequel to Elementary Geometry.* By J. W. Russell. Pp. viii+204. (Oxford: Clarendon Press, 1907.) Price 6s.
- (5) *Text-book of Mechanics.* Vol. ii. By L. A. Martin, Jun. Pp. xiv+214. (New York: Wiley and Sons; London: Chapman and Hall, Ltd., 1907.) Price 6s. 6d. net.
- (6) *Elementary Statics.* By W. P. Borchardt. Pp. viii+398+xx. (London: Rivingtons, 1907.) Price 4s. 6d.
- (7) *Elementary Trigonometry.* With Answers. By C. Hawkins. Pp. xiii+310. (London: J. M. Dent and Co., 1907.) Price 4s. 6d.
- (1) **T**HIS book is a collection of 3500 examples in elementary algebra up to quadratic equations. It will prove useful to those teachers who dictate the book-work instead of leaving their pupils to read it for themselves. The exercises are well arranged, and there is a good list of contents, so that the reader can at a moment's notice find a dozen or more examples of exactly the type he requires for class use. Answers and examination papers are given, and even though the book does suggest cramming, it has a practical value which will ensure it a welcome. The idea might with advantage be extended to other mathematical subjects.